Agricultural Improvement Council for England and Wales

THIRD REPORT

1950–56

LONDON
HER MAJESTY'S STATIONERY OFFICE
1956

MEMBERSHIP AND TERMS OF REFERENCE

The members of the Council on 11th June 1956 were:

Sir Alan Hitchman, K.C.B. (*Chairman*)
Sir Edward Salisbury, C.B.E., D.Sc., Hon.LL.D.(Edin. & Glasgow), F.R.S., V.M.H. (*Vice-Chairman*)
Capt. J. F. Bomford, M.C.
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Sir James Turner, B.Sc., LL.D.
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Professor E. G. White, D.Sc., Ph.D., F.R.C.V.S.
W. Morley Davies, Esq., M.A., B.Sc., F.R.I.C. (*Secretary*)

The Council is reconstituted triennially and a new Council will take office on 12th June 1956. (A note on changes in membership during the period covered by the Report is at Appendix B.)

The Council's terms of reference are:
"To keep under review the progress of research with a view to ensuring that promising results are applied as rapidly as possible to the problems of agriculture and horticulture and that these and any other new technical methods are incorporated into ordinary commercial practice; to advise from time to time concerning agricultural and horticultural problems which appear to require scientific investigation; and to advise generally as to the lines on which a policy designed to raise the technical standard of agricultural and horticultural production can best be implemented."

Note: Throughout this Report the word "agriculture" includes horticulture.

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Agricultural Improvement Council for England and Wales

INTRODUCTION

To the Rt. Hon. D. Heathcoat Amory, M.P.
Minister of Agriculture, Fisheries and Food

Sir,

1. The Agricultural Improvement Council, appointed by the Minister of Agriculture and Fisheries in 1941, presented its First Report in June, 1942, and its Second in June, 1950. The Council now presents its Third Report.

2. By 1950 the pattern of the Council's work and its methods of carrying out its responsibilities had already taken definite shape. The task of the last six years has largely been one of consolidation, but there have also been developments which have affected the work of the Council and resulted in changes in organisation.

3. In the first place, there have been changes in agricultural policy. The Government has ceased to be the main buyer of the major agricultural products and the farmer has again been free to decide what he will produce. This has led to a new emphasis being placed on efficiency and the reduction of costs and, at the same time, to changes in farming practice in many districts. For example, there has been a shift back to grass in the traditional grazing areas where arable cropping has never been really popular, and the various aspects of making the best use of grass have frequently been before the Council. Another example is the need for more attention to be given to quality of produce in the new conditions and the Council has also this point constantly in mind.

4. Secondly, it has become increasingly clear that more attention should be paid to such matters as design of farm buildings, layout of packing sheds, grain storage, field drainage, irrigation and water supplies, and in June, 1953, the Council's activities were extended to cover an examination of the technical problems of land ownership. The Land Management Committee was set up and additional appointments to the Council were made. This widening of the Council's sphere has brought it into the same relationship with the Agricultural Land Service (A.L.S.) as has been maintained throughout with the National Agricultural Advisory Service (N.A.A.S.).

5. The control of land pests is another important problem which can be solved only through a scientific approach and which has received increasing attention from the Council. The Council has taken a close interest in the development of this work by the Infestation Control Division of the Ministry. It is consulted on the research programme of the Division and receives reports on the results of investigations.

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Organisation

6. As explained in the previous Reports, much of the work of the Council is carried out through Committees to which are appointed, in addition to members of the Council, research workers and persons with practical experience of the subject. A list of Committees and their membership is given in Appendix A.

7. With the continued expansion of the activities of the Experimental Husbandry Farms and Horticulture Stations of the N.A.A.S., the work of the corresponding A.I.C. Committees has greatly increased. The Experimental Husbandry Committee is responsible for advising on the choice of sites for Experimental Husbandry Farms and the work to be undertaken on them; and there are Crop Experiments, Animal Experiments and Poultry Experiments Sub-Committees to consider the detailed design of each experiment. The Experimental Horticulture Committee is parallel to the Experimental Husbandry Committee in composition and functions, and its Working Parties for Hops, Bulbs, Protected Cropping, Glasshouses, Flowers, Vegetables and Fruit cover all the more important aspects of horticulture. There is in addition a Plant Pathology Committee, which advises on all relevant experimental work. The Experimental Husbandry and Horticulture Committees also receive and comment from time to time on reports of experimental work carried out by N.A.A.S. Provincial Experiments Committees on private holdings.

8. The Land Management Committee is concerned with the technical problems of land ownership, especially such matters as concern the fixed equipment of the farm. The detailed examination of problems is remitted to four Sub-Committees: Buildings and Roads; Ownership Economics; Horticultural Buildings; and Field Drainage, Water Supplies and Other Services.

9. Most of the Husbandry Groups referred to in paragraph 45 of the second report have been disbanded, but the Poultry and Horticulture Groups have remained active. In addition the Fenland and Peat Committee has kept under review the special problems associated with peat soils, and the Taint Committee has been surveying the problems associated with "tainting" or alteration of flavour of a crop resulting from the use of newer forms of insecticides and herbicides which render it or a subsequent crop unpalatable or unfit for human consumption. The farming problems particular to certain types of soil (chalk, sand, etc.) are being examined by the Types of Farming Survey Committee. The most extensive enterprise it has yet undertaken is the "Survey of the Agriculture of the Sand Lands." This is dealt with in paragraphs 179-181 below.

PART I

THE LINKS BETWEEN AGRICULTURAL RESEARCH AND THE FARMER

10. The Council's terms of reference require it both to see that the results of research are applied in practice and that the problems encountered in practice are referred back to those responsible for directing agricultural research. It thus has to keep in close touch with both the research side and the practical side and to see that the information is flowing rapidly and effectively between them in

both directions.

11. In practice the flow of information depends largely on personal contacts between research workers, the Secretariat of the A.I.C. and the Agricultural Research Council (A.R.C.), the N.A.A.S. and other technical services of the Ministry, and farmers in the day to day conduct of their work, through the common membership of committees, and by means of special conferences. The A.I.C. could not possibly cover the whole field itself: its duty is rather to see that the process is and remains effective.

SOURCES OF RESEARCH RESULTS AND KNOWLEDGE

The Agricultural Research Council

12. The Agricultural Research Council is responsible for co-ordinating the programmes of agricultural research work financed directly by the State. As part of the function of co-ordination, the A.R.C. is responsible for ensuring that, as far as is possible, the agricultural research service is attacking the problems of greatest importance to the industry. Its function is to influence rather than to direct research.

13. The A.R.C. itself deals with questions of general policy and the overall co-ordination of agricultural research, leaving much of the detailed scientific consideration to its Standing Committees, Technical Committees and Conferences. These Committees bring together, for particular aspects of agricultural research, the scientific specialists, farmers and those with practical experience to contribute and officers of the N.A.A.S. and other technical services of the Ministry. The staff of the A.I.C. also keep in touch with the work of these Committees.

Universities and Colleges of Agriculture

14. The Council through the A.R.C. is able to keep in close touch with research and investigations carried out in universities and colleges of agriculture. In a number of joint experiments being conducted by research institutes and experimental centres the universities are willing contributors. Such collaboration ensures a much wider range of conditions and therefore more reliable results.

Investigation and research carried out by the N.A.A.S.

15. It has always been recognised that, in addition to the provision of advice to farmers, it is the function of an advisory service to carry out experimental work both in the laboratory and in the field on local problems. At each N.A.A.S. Provincial Centre there are well equipped laboratories, under the charge of scientific staffs. The problems that arise are extremely varied. Some of them may be easy of solution; others are very complex. If a problem is beyond the scope of the officer concerned it may be referred to the Council with a view to recommending it as a subject for attention by a research station. Much of the investigation work of the N.A.A.S. is carried out in collaboration with a department of one of the research institutes. An example of this is the extensive series of trials carried out all over the country on newer forms of phosphate fertilizer in conjunction with the Chemistry Department of Rothamsted Experimental Station. On a few occasions grants from the A.R.C. have been made to enable

advisory officers who are acknowledged experts in particular phases of their own subjects to extend their experimental work.

16. In addition to that carried out by the Science Specialists of the N.A.A.S. much field investigation is carried out by the Provincial Husbandry Officers, assisted as may be necessary by the local agricultural advisory officers. Again such work may well be a joint enterprise involving research institutes, the Plant Pathology Laboratory or the National Institute of Agricultural Botany.

Experimental Husbandry Farms and Experimental Horticulture Stations

17. The Experimental Centres of the N.A.A.S., a list of which is at Appendix C, provide facilities for long-term complex experiments, often expensive to conduct, the results of which are vital in solving long standing problems of the industry. Although the main flow of results from the trials and experiments cannot come for several years, there will be some which will be available more quickly.

Institutes and farms of local authorities

18. Farm Institutes, which are necessarily limited by their teaching requirements give much help on their farms with the less complex type of experiment.

Other bodies and sources

19. Outside the channels already indicated, technical data arising from surveys and experiments are being sought wherever they may be available. For example, the Technical Advisory Conference on Restoration of Opencast Coal Land is responsible for initiating investigations devised to provide information on the best methods for cropping deeply disturbed soil sites.

20. Finally, mention must be made of the large amount of investigation carried out by the research teams of manufacturers both in this country and abroad. While little of this reaches the Council direct except on request, much of it is contained in publications from the firms themselves or in articles in scientific journals and contributes materially to the improvement of farming.

TRIALS OF RESEARCH RESULTS

21. Agricultural problems are sometimes solved fairly quickly but more often it is necessary for the results of research to be tried out over a considerable period before they can be recommended with confidence to farmers throughout the country. This is one of the main reasons why the Experimental Centres were established. Here, the results of research work can be tried out on a field scale under conditions more akin to actual farming practice, and since these centres are situated in areas of widely differing geophysical and meteorological types, sufficient variety can be obtained to make tests of validity for general application. It is an encouraging feature that these Centres are attracting so much interest on the part of farmers and growers and there is evidence that their example is having a beneficial effect on the agriculture of the areas in which they lie. During the period from 1st April, 1955, to 31st March, 1956, there were 9,809 visitors to the Husbandry Farms and 8,035 to the Horticulture Stations.

22. Where a field experiment need not take long to carry out, the practising farmer is often eager to offer facilities. A considerable number of such experiments are arranged by the Experiments Committee in each N.A.A.S. province and are usually a joint effort between the advisory officer and the farmer, the former being responsible for the proper conduct of the experiment and the latter affording facilities of land, cultivations, harvesting etc.

23. If a research worker himself requires to pursue investigations in the field there are arrangements by which he can be put in touch with suitable farms.

MEANS OF BRINGING THE RESULTS OF RESEARCH AND INVESTIGATION TO THE INDUSTRY

24. It falls mainly to the N.A.A.S. to interpret to the farmer the results of research which can confidently be put into practical application. "The Report on the National Agricultural Advisory Service: The First Eight Years 1946-1954," which was published last year, explains in detail how the Service carries out this task and it is therefore unnecessary to mention more than one or two major features of the work of the Service.

25. Over the period covered by the Council's Report the N.A.A.S. has strengthened both its capacity to advise on the problems of farming and its position among farmers. The scale of advisory visits and of group activities is proof of the use which farmers are making of the Service. The Service has played a full part in dealing with crucial problems of technical development, such as the utilisation of grassland, and in the development of its farm management advisory work has responded to the needs of the time. The Council feels that the benefits to agriculture from good technical services cannot be exaggerated and hopes that every effort will be made to ensure that they are fully staffed and equipped. It attaches particular importance to the maintenance of an adequate strength of general advisory officers in the districts, and to the development of the work of the N.A.A.S. Experimental Centres.

Other means of passing information to the farmer.

26. New information may reach the farmer through channels other than those already mentioned. Examples are the agricultural press; Ministry publications such as "Agriculture," "Experimental Husbandry," bulletins and leaflets; broadcasting and television, and commercial firms in the agricultural field, many of which employ advisers or salesmen with graduate or diploma qualifications.

27. An important part is played by the local education authorities. Theirs is the responsibility for systematic courses of instruction in agriculture, whether at Farm Institutes or through extra-mural classes and lectures, as part of the provision which they make for technical education generally. Behind these courses lies the same body of knowledge as is drawn upon by the N.A.A.S. for its advisory work; and there is a great deal of mutual help between the authorities and the N.A.A.S. in the pursuit of their common educational objective.

28. The keen interest taken by progressive farmers in new developments and their willingness to try them out in practice are most encouraging features of British agriculture today. Research and advisory workers would be the first to admit the stimulus of contact with farmers of this kind.

REVIEW OF PROBLEMS REQUIRING INVESTIGATION AND RESEARCH

The Work of the Joint Committee

29. Problems may be put to the Council through a number of channels. They may come directly from the industry, through the N.F.U.; they may be forwarded by one of the conferences of Provincial Directors or husbandry or scientific officers of the N.A.A.S.; or they may arise in any committee or working party of the Council itself. Such *ad hoc* methods, however, did not provide a sufficiently thorough treatment of this important part of the Council's obligations, and it was decided to carry out a systematic examination of the problems arising on each of the main agricultural commodities.

30. The first stage is to ask persons who are acknowledged authorities in their own particular fields and fully conversant with research in progress to draw up lists of items requiring consideration. Since the interests not only of the Agricultural Improvement Council for England and Wales, but also those of the Agricultural Improvement Council for Scotland and the A.R.C. are involved, the detailed examination of these papers on each commodity is carried out by the Joint Committee of the three Councils, which has been reconstituted for the purpose.

31. The Joint Committee is a small body of 7 members, a chairman and two from each of the three Councils. The Committee invites to each meeting a number of persons, both scientists and practising agriculturists who are experts on the commodity under discussion. The subjects receive very detailed examination, taking into consideration earlier consultations carried out by the Secretariat with such bodies as the Department of Agriculture for Scotland; the Development and Education Committee of the N.F.U.; relevant N.A.A.S. Specialist and Husbandry Conferences; the Plant Pathology Laboratory; the Veterinary Laboratory; the National Institute of Agricultural Botany; with Directors of research institutes in England and Wales and Scotland and with well known individual agriculturists.

32. Each problem receives a priority classification and, following submission to both Improvement Councils, the paper is forwarded to the A.R.C. for further detailed study in the light of existing research and of scientific manpower. The problems of the production of Pigs, Apples, Grass, Oats, Poultry and Potatoes, have so far received consideration in this way. Thus it is intended that the A.R.C. which is responsible for the organisation and development of research, will be able to obtain a comprehensive view of the most important unsolved problems of the industry. Only in this way will it be possible to assess whether the amounts of money being spent on particular enterprises are adequate and whether the scientific staff available—limited in agricultural research as elsewhere—is being deployed to the best advantage.

National Fruit Trials

33. The testing of the performance of new varieties of fruit against accepted commercial varieties is of particular importance to the fruit growing industry. Tests of this kind with both top and bush fruit have been carried out for many years at the Royal Horticultural Society's Gardens at Wisley.

34. With the advent of the N.A.A.S. it was recommended by the Council's Experimental Horticulture Committee that this work should be sponsored directly by the Ministry and be carried out at a National Fruit Testing Station set up near the East Malling Research Station. A site for the new Station was acquired by the Ministry in 1953 at Brogdale Farm, Faversham, Kent and the National Fruit Trials (Brogdale) was set up there under a Director who is also in charge of the work at Wisley.

35. Good progress is being made in the gradual transfer of the stocks at Wisley to the new Station. The Council is kept in close touch with these developments, since one of its members is Chairman of the National Fruit Trials Advisory Committee.

TECHNICAL ASPECTS OF AGRICULTURAL POLICY

36. The Council is also called upon to give technical advice to the Ministry in connection with the framing of policy or problems arising out of existing policy.

37. In recent years the Council has been asked to consider, annually, from the scientific and technical points of view, a review of agricultural production objectives and progress. Other matters referred to the Council, which are dealt with individually in Part III of this Report, have included progeny testing in pigs and in poultry, the nuclear (virus free) stocks scheme, bull licensing, the export of deep-frozen semen and artificial insemination in pigs.

PART II

EXPERIMENTAL WORK UNDER THE COUNCIL'S GUIDANCE

38. The nature and purpose of the Experimental Centres have been described above. The following pages give an account of the main experiments.

Experimental Husbandry Farms (E.H.Fs.)

39. **Ley fertility experiment.** This is being carried out at six of the Farms. In it an arable rotation is being compared with (*a*) a three year ley grazed each year, (*b*) a three year ley from which produce will be cut and conserved, (*c*) a three year lucerne ley grazed and mown, and (*d*) long term grass (probably 9 years) grazed each year.

40. The influence on soil fertility will be measured by the subsequent yields of three crops—potatoes, wheat and barley. The sub-treatments include two levels of nitrogen for the leys and arable crops, and a comparison of the presence and absence of farm-yard manure on the potato testing crop. Yield figures will not be available for the first few years and since the build-up of soil fertility is slow a number of years would in any case be required before any differences due to the various treatments became apparent.

41. **Disposal of straw.** Experimental work carried out earlier at Rothamsted and

at the Norfolk Experimental Station is now extended to four Farms to discover the effects on fertility of straw (a) ploughed in, (b) removed and returned as dung, (c) burned and (d) all removed. Of recent years controversy has centred around one or other method of disposal and it may be that the answer will vary in different districts. By its very nature this experiment willl have to continue over a number of years before the answer becomes plain.

42. **Deep ploughing versus normal ploughing.** Dr. E. W. Russell's work on the effect of depth of ploughing on crop yield carried out both during and subsequent to the war has not shown the clear results which were expected. It was thought, however, that other factors might have influenced the results of the trials, which had to be carried out on commercial farms. Consequently somewhat similar but more detailed experiments were laid down on four of the Farms. However, the results so far indicate little or no difference between the various treatments.

43. **Residual effects of phosphate and potash.** Farmers have long taken into consideration residual nutrient effect when planning their cropping and fertilizer treatment. The range of soils and climate on the Farms affords the first opportunity for detailed study of this important problem. How these effects vary with rainfall and evaporation, and soil types and class of fertilizer is of particular importance to advisory officers in drawing up manurial and cropping programmes for commercially run farms. Four classes of phosphate fertilizers applied at different rates are being compared on six of the Farms. At five of the Farms the experiment is extended also to include the residual effects of potash.

44. **Reference plots. Long-term fertilizer effects.** Much is known about fertilizers and their effects on crop yields but less is known about the effects on the quality or the make-up of the plant. A series of plots on which a specified manurial treatment is given to each crop every year has been laid down on five of the Farms. There will be a range of crops grown on a rotation but varied as needed. These plots will afford opportunities for the study of many important problems as well as having a high educational value for farmers and advisory officers.

45. **Shorter term and local experiments on crops and grass.** The long term problems briefly described above have wide interest but there are others, not necessarily of less importance, but of greater interest to the area in which a particular farm is situated. As an example, one such problem is now being investigated at High Mowthorpe E.H.F. in Yorkshire. It is the practice of some Wold farmers to have their chalk soils limed at regular intervals. At first sight this would seem unnecessary since much of the land has a high proportion of lime in it. Local belief in this practice is considerable and it was thought worthwhile putting it to the test. Up to the present the results have shown no benefits in crop yields as a result of liming.

46. Another shorter term experiment concerning the effect of restorative crops on the fertility of light sand land is in progress at Gleadthorpe E.H.F. in Nottinghamshire. Here a comparison is being made between (a) lupins ploughed in, (b) one year's seeds managed in different ways, (c) a fallow followed by mustard ploughed in and (d) potatoes.

47. A third problem peculiar to industrial areas is being studied at Great House E.H.F. in Lancashire. This concerns grass management and productivity under conditions of smoke laden atmosphere and high rainfall.

48. As a further example the variety trials on arable crops jointly carried out by the National Institute of Agricultural Botany and the N.A.A.S. have now been extended over a greater range of soils on a wide variety of crops.

49. There are a number of other short term experiments and observation studies.

50. **Experiments with cattle.** Experiments with animals are both more difficult to design—there has been less experience with them—and more difficult and expensive to carry out than crop experiments. But they are certainly no less important.

51. **Rearing on different planes of nutrition.** At three Farms dairy heifers, calves and yearlings are being reared on two planes of nutrition—medium and high. The experiment is an extension to dairy cattle of that carried out on the Cambridge University Farm with beef cattle. The object is to determine the effects on the life time yield of the cattle of varying planes of nutrition during the first two years of their life. Valuable information is also being obtained on the growth rate and fertility of the groups. Each animal is milk recorded from the time it comes into the herd and the performance is then related to management during upbringing.

52. Another experiment with animals is concerned with developing the production of beef from cattle which are surplus to the requirements of replacements for milking herds. At two Farms groups of pure-bred and cross-bred calves are being reared and fed for beef. Detailed measurements and records are being kept of each group and carcases will be examined for quality.

53. **Experiments with pigs.** A reciprocal crossing experiment has been started at two centres to compare two pure breeds and their crosses. The aim is to discover whether cross-bred vigour can be measured in terms of more rapid liveweight gain or efficiency of food conversion and carcase quality. In another pig breeding experiment Landrace and Large White boars are compared for their suitability for crossing with Wessex Saddleback sows.

54. Two experiments were set up in conjunction with the A.R.C. to test out antibiotics in feeding. The original trials and a follow-up experiment have been completed.

55. **Experiments with poultry.** At Gleadthorpe E.H.F. different rations are being tested under four distinct methods of management:—fold units, colony houses, batteries, and deep litter houses. Extensive records include egg yields, egg quality, mortality, etc. At Great House E.H.F. work on comparison of different degrees of insulation of housing on egg production is in its second year.

56. At Trawscoed E.H.F. some studies on poultry feeding are in progress.

57. **Experiments with Sheep.** Work is in progress on the types of birth coats of lambs and their relationship to the good and bad characteristics found in mature sheep. At four Farms the relative merits of the practice of first breeding from lambs and from shearlings are being studied. There are also several trials on certain disease aspects of sheep husbandry, especially the problems arising from the intensive stocking of leys.

58. **Future work on the Farms.** Space on the Farms is of necessity limited, and the problems awaiting investigation are numerous. In the post war economy the increased importance of converting home produced feedingstuffs into animal

products presents vast problems. The difficult problems involved in measuring and studying the output of grassland are likely to occupy an increasing part of the facilities.

Experimental Horticulture Stations (E.H.S.)

59. **Cultivation experiments.** The long-term experiments are concerned with the effect of various cultivation practices both on the land and on crops. Ploughing, roto tillage and hand digging are matters which require an approach of a more quantitative nature than has hitherto been possible. Irrigation experiments on vegetables (and later on fruit), both alone and in combination with other treatments will receive careful study in the light of modern meteorological guidance.

60. **Fruit.** The Stations most concerned with fruit trials will be Luddington E.H.S., Efford E.H.S., and in due course one in East Anglia. Some seventy acres at each will be allocated to the fruit trials. Local variety trials in conjunction with the National Fruit Trials at Wisley and Brogdale will provide more accurate information than is now possible of varying environmental effects on fruit characteristics. The central trials at Brogdale will include a comprehensive collection of tree and soft fruit and a series of preliminary and main trials of newer varieties: the whole will incidentally provide a valuable reserve of varieties for the geneticists.

61. Other long-term trials at all the main Stations will be concerned with pruning, tree nutrition and soil management of apples, pears, plums and a range of soft fruits.

62. Control of diseases of pests of fruit will also figure largely in the investigations. An example is to try out selected stem-building varieties for the control of Bacterial Canker in plums. A nutritional experiment already started in conjunction with leaf analysis is designed to test out the effects of various rates of application of nitrogen, phosphates and potash on growth and cropping of varieties of blackcurrants which may be of especial value for perennial crops.

63. A very important economic problem is the maintenance of clean virus-free stocks of all kinds of fruit and vegetables and this necessitates a never ending search for methods of controlling the insect vectors of virus diseases. A case in point is the Strawberry Virus and for this purpose the effects of various systemic insecticides are being observed. In conjunction with the Meteorological Office more extensive work is under way on the question of wind breaks and shelter belts, particularly their effectiveness in protecting crops and assisting growth and ripening. At Rosewarne E.H.S. in Cornwall where sea winds can be particularly destructive this matter becomes specially important.

64. In the field of disease investigation, certain areas have been set aside where close collaboration between the Research Institutes and Provincial Plant Pathologists and Entomologists is being arranged.

65. **Glasshouse work.** Experimental work in the design of glasshouses at the John Innes Horticultural Institution has shown the need for more basic work. Extension of these investigations has been made possible at Fairfield E.H.S.

66. In conjunction with the National Institute of Agricultural Engineering, experiments on glasshouse heating will be conducted at Fairfield E.H.S. and Efford E.H.S. and will include low pressure hot water, high speed hot water and low

pressure steam. A study of ventilation in relation to the micro-climate of glasshouses is also a subject of scientific investigation now being made possible for the first time in this country. The importance of such studies cannot be over emphasised since they are basic for an understanding of management and disease control.

67. In addition to more fundamental studies, local interest is being catered for at all Stations. For instance, at Fairfield E.H.S. the growing of lettuce in new glasshouse soil is of special interest in Lancashire owing to the losses commonly experienced.

68. Flower Crops. Plans for investigations have so far not advanced to the same point in this field as they have in the others. Arrangements are being made, however, for intensive study of problems of bulb growing at Kirton E.H.F. in Lincolnshire and at Rosewarne E.H.S. in Cornwall; nutritional experiments, methods of weed control, testing of varieties and disease control are also being examined. There is much work to be done in the way of cleaning up stock, checking names, etc. as an essential preliminary to any extended scheme of investigation.

69. Vegetable Crops. Some of the most important experiments planned and being developed include variety and strain trials in conjunction with the National Institute of Agricultural Botany; weed control in collaboration with the A.R.C. Unit of Experimental Agronomy at Oxford; and spacing trials with the National Institute of Agricultural Engineering to provide basic information for the development of designs of machines for optimum drilling distances.

70. Experiments with crops under Dutch lights are in progress and are concerned mainly with spacing of lettuces and soil warming. Luddington E.H.S. and Stockbridge House E.H.S. are paying much attention to the study of the proper method of using Dutch lights, particularly to suitable orientation.

PART III

PROBLEMS CONSIDERED BY THE COUNCIL

71. This section of the report is intended to provide some indication of the many types of problems considered by the Council. The following examples represent a cross-section of these problems.

CROPS

72. Use of cut potato seed. The high cost of seed potatoes, now about £30 per ton, is a major item in the costs of potato production. Any acceptable method of reducing the amount of seed without loss of cropwould therefore be of considerable benefit. The Council considered this subject both from the farming and potato research aspects, and in the light of American experience. It came to the conclusion that the use of cut seeds may not necessarily be successful under our own system of potato growing. There are indications that a saving of seed, comparable with that possible by using cut setts, might be achieved by paying closer attention to seed spacing in the row and the distance between rows. Further consideration is being given to these points and to the question whether experimental work on cut setts and on spacing and size of seed is necessary.

73. **Investigations on peas for processing.** Payment to growers of vining peas (peas picked green for canning or freezing) is generally related to the results of tests for the appropriate stage of fitness for processing. These tests, which involve laboratory determinations, were stated not to be altogether reliable, nor very readily carried out. The Council's advice was sought on the possibility of devising a more objective assessment.

74. The instrument known as the "tenderometer" is in use both in this country and elsewhere for this purpose. Besides being in regular use it has been under a four year test at the Fruit and Vegetable Preservation Research Station, Chipping Campden. Investigations have shown that its greatest drawback is the difficulty of maintaining standardisation so that all instruments give the same reading with the same batch of peas. At the Council's request the Department of Scientific and Industrial Research has been asked to continue investigation of this problem.

75. **Survey of maincrop potatoes.** The second interim report on a survey of maincrop potatoes carried out by the Rothamsted Experimental Station in collaboration with the N.A.A.S. was submitted to the Council in October 1950. The survey drew attention to, and confirmed, a number of established views as to why potato yields may fall short of what could be expected. One of its outstanding conclusions concerned earlier planting. Advancing the planting date by ten days within a critical period in spring was found to increase crop yield by as much as 10%. Other points which were brought out included (a) fertilizer should be applied after opening the furrows, not before, in order to gain the advantage of fertilizer placement (b) the value of farmyard manure (c) considerable economy is possible in the use of artificial fertilizers, when farmyard manure is used, expenditure on fertilizer possibly being reduced by as much as 30s. 0d. per acre in this way (d) a saving of 5-10% of the crop may follow greater attention to the setting of harvesting machinery.

76. On the basis of these conclusions suggestions were put forward for field experimental work on different soil types to confirm some of the findings in greater detail, and experiments on these lines were incorporated in the experimental programmes of the N.A.A.S.

77. **Potato root eelworm.** Annual losses to farmers through the reduction of potato crops due to root eelworm were estimated in 1949 to be of the order of £2,000,000 annually. Attention to rotations and avoiding highly contaminated fields as indicated by sampling have now reduced this figure considerably. Mention was made in the Second Report of the Council of lines of research and investigation which are being followed in the problem of controlling this pest. The Council has continued to keep the problem under review and has made representations to those responsible regarding the training of more research workers in nematology.

78. Fundamental research is being carried out to discover any facts which may bear on means of control. Search for a satisfactory chemical treatment of the soil for inducing the cysts remaining in eelworm infested land to hatch out in the absence of the host plant has continued and there are numerous field studies, for

example on the use of potatoes as a trap crop, the potatoes being lifted after infestation but before the cysts have time to develop; on the effect of removing ground keepers; and on soil treatments with fumigants to destroy eelworm cysts.

79. More recently work has developed on breeding resistant lines of potatoes following the discovery of the resistance to eelworm of certain lines of *Solanum andigenum*. Breeding for resistance to a particular pest is, however, a lengthy procedure and there is always the possibility that the new breeding material may be less resistant to other pests and diseases than the varieties already in commercial use.

80. **Cereal root eelworm.** An increase in the number of reports of damage to cereals by cereal root eelworm, (mainly oats, but other cereals are also affected) led to the carrying out of a national survey of the incidence of this nematode in 1954. This indicated that the eelworm occurs in all but very few counties in England and Wales. Forty three per cent of the fields sampled in the survey were found to be affected. The observations on crop damage, however, indicate that actual losses are related as much to local conditions such as soil type and crop rotation as to the presence of the pest. Light soils appear to be more commonly and more severely infested with cereal root eelworm than heavy soils.

81. As with potato root eelworm a search for resistant strains of cereals may lead to providing a better method of control. The biology of cereal root eelworm differs from that of potato root eelworm and a suitable experimental technique for investigating methods of control needs to be developed.

82. **Wheat bulb fly.** The wheat bulb fly may be considered the most serious pest of wheat in this country. Control of the fly by the use of soil insecticides has met with little success except when applied as seed dressings to seed sown early in the year.

83. The Council was advised of the need for more extended field studies of the effects of insecticides at various stages in the life cycle of the fly and for detailed laboratory studies of its biology. An approach by the Council to the A.R.C. for assistance in these studies was made and two research workers were appointed at Rothamsted and at the Cambridge N.A.A.S. Centre to enable the work to be extended.

84. **Fodder beet.** The main factors of economic importance in growing roots for feeding to farmstock are yield of dry matter per acre and ease of lifting. Though the type of mangold grown in this country is easy to lift, it is too watery. Fodder beet, on the other hand, has a higher dry matter content, and trials carried out in this country on the recommendation of the Council with Danish high dry matter types of fodder beet (18-22% dry matter, as compared with 7-15% for mangolds) have shown that it can replace half the meal in rations used for fattening pigs. The high dry matter types, however, are difficult to harvest, and in practice the medium dry matter types (15-18% dry matter) seem to combine a high yield of dry matter with less difficulty in lifting; abroad, and especially in Denmark, the acreage of these medium dry matter types has rapidly grown at the expense of mangolds. As one would expect, interest in fodder beet in this country has declined considerably since the freeing of the cereal markets in 1954.

85. **Trace element deficiencies in Romney Marsh.** An enquiry into the occurrence of trace element deficiencies affecting crops in Romney Marsh was made during the war and in the years immediately following. Manganese deficiency was es-

tablished and there were indications that other trace element problems may possibly occur as well. As an extension of this work a survey of fertilizer practice was made. The N.A.A.S. is also carrying out each year a number of trials involving a number of the trace elements.

86. One of the field teams which the Soil Survey of Great Britain is gradually establishing at provincial centres is located at the N.A.A.S. Sub-Centre at Wye and the work there is expected to provide a fund of basic knowledge on soil types in the Marsh and their possible relation to mineral deficiencies.

87. Data from improved hill areas in Montgomeryshire. One of the most important considerations in assessing the return from land improvement and reclamation schemes is the length of time the effects will persist. A unique opportunity to measure this has been afforded on some thousands of acres of land in the Dolfor-Kerry Hills in Montgomeryshire which were cleared of their natural vegetation, cultivated, cropped and finally reseeded in the period 1941-1945.

88. Observations which involve records of the type of stocking of the land, its carrying capacity, the productivity and quality of the herbage, changes in botanical composition, the effect of fertilizer, trace element additions, and so forth, have been the subject of a number of interim reports to the Council, on whose recommendation the investigation has been grant aided for a number of years. So far the observations show that the reseeded swards do not suffer reversion as quickly as is commonly supposed; for example, bracken has not appeared even after 12 years on land originally infested with it. Some of the occupiers of this reclaimed land are so convinced of the value of the work done in improvement that they themselves are taking over land that has suffered through subsequent bad management and grazing with a view to bringing it back into higher productivity.

89. Nomenclature for strains of grasses and clovers. In 1952 the Council recommended that the proposals of the Scottish A.I.C. for a more uniform system of naming strains of herbage plants should be referred to an appropriate committee of the A.R.C., so that they might eventually form the basis of a uniform system throughout Great Britain, and thus avoid the confusion that arises through the use of a multiplicity of names for the same variety or strain.

90. The proposals have been considered by a committee representing interested organisations in England, Wales and Northern Ireland including the Commonwealth Bureaux of Plant Breeding and Genetics and of Pasture and Field Crops. The committee has now reached complete agreement on the principles to be adopted and on the steps necessary to establish an orderly nomenclature throughout the United Kingdom. It presumes that the official plant breeding and testing organisations in the country will in due course apply these principles and that the necessary field work will proceed as facilities allow. The committee considers that a national register will be the most convenient means of making information on herbage strains available to those who need it, and that the N.I.A.B. and the Plant Registration Station at Edinburgh should be recognised as the official centres for this scheme. The proposals are receiving consideration by the Agricultural Departments.

91. Grazing intensity using sheep and cattle. In the past high stocking with sheep was considered undesirable because it might increase sheep diseases, especially those of the parasitic type. It was alleged to be the main cause of a "sheep sick" condition of pastures. Doubts are now beginning to arise, however, as to the validity of this contention and the number of farmers who habitually run six sheep to the acre all the year round, and perhaps eight sheep to the acre in summer, is increasing.

92. The Council has examined the trend towards higher stocking with sheep by discussions with farmers who practise it. An outstanding example is afforded by the Romney Marsh area where meat production per acre per year from sheep is about five times that obtained in other areas where high stocking is practised. One factor in this high stocking capacity appears to be the character of the Romney Marsh sheep itself which through centuries of breeding has become hardy enough to withstand the rigours of the Marsh and has developed a high resistance to parasitic infection. Another possible factor is the capacity of the Marsh grazing to maintain its condition in dry weather. Steps have been taken to collect further information on high stocking practice.

93. The subject is now being investigated experimentally by comparing extensive with intensive stocking at the Experimental Husbandry Farms. There the effect of running cattle and sheep together will be studied with particular reference to the degree of stocking with sheep that can be practised without interfering with the level of output of beef.

94. Green crop conservation. Arising out of the need to produce more home-grown foods of high quality the Council has given special attention to developments in the making of hay and silage as most of the losses of nutrients that occur during conservation are attributable to inefficient methods of handling. First class hay, for example, contains almost twice as much protein as poorly made hay, while with silage, over a third of the nutrients may be lost during the conservation process.

95. A study of developments both at home and abroad shows that there is considerable scope for improvement in both processes; for hay, the use of the pick-up baler, quick turning of the swath, barn drying of bales and tripod haymaking have been advocated and are coming into farm practice. There still remains, however, a lack of reliable evidence of the relative merits of the different conservation methods under different conditions of season and farm management. The Council has accordingly encouraged the putting in hand of a series of critical investigations on silage and hay making at the Experimental Husbandry Farms. In the silage investigations it is proposed to compare a number of factors affecting the final product, e.g. the effect of bruising, wilting and treatment with additives such as molasses or sodium metabisulphite. The haymaking investigations will be designed to show mainly in what way the process can be speeded up so as to keep losses of nutrients to the minimum.

96. 'Finishing' value of fattening pastures. Farmers have claimed that pastures apparently similar in many respects may have widely different capacities for 'finishing' cattle. This was one of many points raised at a grassland conference at Newcastle in 1946 and mentioned in the previous report of the Council. It was considered that the validity of this claim might be tested and a survey of the stock-carrying capacity and grazing management in two of the most productive grass fattening areas was carried out at the Council's suggestion.

97. In this survey no real evidence was found of the existence of 'finishing' as opposed to 'non-finishing' pastures. Where differences in 'finishing' ability were observed it was shown to be mainly correlated with differences in management or with marked contrasts in soil type.

98. Bracken control. Much careful study has gone into the technical aspects of the problem of bracken eradication and many methods have been tried. On land where agricultural implements can readily be used bruising or cutting will bring marked improvement. Difficulty arises, however, on steep slopes or in areas where live rock occurs, rendering mechanisation difficult or often impossible. Spraying with weed killers has not yet proved effective. The problem appears to be partly one of cost and partly of terrain but there are excellent examples where farmers have tackled this problem with considerable success.

99. Control of rushes. Rush infestation considerably reduces the grazing value of many of our poorer pastures and is a problem to which the Council and its committees have given much attention in the past few years. Since rush seeds remain in a viable condition in the soil for many years, ploughing up and reseeding an apparently rush-free area of land can result in heavy invasion by rushes from buried seed.

100. Cutting or a combination of cutting and treatment with herbicides appears to offer some measure of control and a large number of trials on these lines have been laid down by the Unit of Experimental Agronomy at Oxford in collaboration with the N.A.A.S. in different parts of the country. Experimental work on methods of control is also being done in Scotland where the problem is no less important than in England and Wales.

101. The Experimental Husbandry Committee considers that the solution to the problem of rush control lies as much in the field of general management of pastures as in the application of chemical weed control or any other measure. It is clear that any procedure which encourages grassland species such as draining, liming and manuring tends to alleviate the effects of rush infestation.

102. It seems likely that more fundamental research on the botany and ecology of the rush would considerably assist in elucidating the problem of control. The Council has therefore drawn the attention of the A.R.C. to the need to appoint a suitable worker for this more fundamental approach.

103. Fluorine poisoning of cattle. Fluorine poisoning of cattle has been reported on numerous occasions from farms in the neighbourhood of certain industries such as steel and ceramic works etc. which emit gases and dust containing fluorine. During grazing the animals ingest the fluorine compounds which settle out on the herbage from the fume-and smoke-laden air. Lameness, loss of condition and drop in milk yield are the more obvious signs but dental lesions may also seriously affect the animals. In areas where contamination is severe the maintaining of milking herds becomes uneconomic and there may be no alternative but to change the type of husbandry practice, for example, by keeping flying herds only, by replacing ruminant stock by pigs and poultry, or by restricting the grazing of contaminated pasture.

104. At present the fluorosis problem is being investigated mainly from the veterinary side, by exploring the possibility of mitigating the effect of fluorosis in dairy cattle and by getting information on the number of farms affected and the degree and extent of contamination of agricultural land in industrial areas. Fluorosis is part of the general problem of air pollution to which reference is made in paragraphs 167-170.

105. Research on foot-and-mouth disease. In 1952, at the request of the Minister, the Council together with the Ministry's Chief Veterinary Officer and the Director of the Foot-and-Mouth Disease Research Institute at Pirbright, considered the progress in research on this virus disease in relation to the policy in this country of slaughtering affected stock and preventing the spread of the disease by controlling the movement of stock in affected localities. In particular, consideration was given to the possibility of alternative forms of control practised in other European countries, notably the use of vaccines. Losses in stock in Great Britain through the existing slaughter policy, which is directed towards the eradication rather than the mere control of the disease, are sometimes high but losses in European countries, where without a slaughter policy it is impossible at present to stop the disease becoming endemic, are very much greater. At Pirbright an intensive study of virus types including many occurring abroad, and of the protective value of vaccines, has been in progress for some years and a clearer picture is now emerging.

106. The Council endorsed the present policy of slaughter and movement control of stock in combating the disease and advised the Minister accordingly. Following the deliberations of the Council a Departmental Committee under the chairmanship of Sir Ernest Gowers was appointed in September, 1952, to investigate the policy and arrangements for dealing with foot-and-mouth disease in Great Britain. Their Report was published in July, 1954.

107. Deep frozen cattle semen. The storage life of bull semen held at a temperature of 2° centigrade is limited. It has been found that by using the deep freeze technique at minus 90° centigrade the semen can be used successfully for insemination after storage at that temperature for as long as nine months. By the use of this method stocks of semen can be built up during the quiet months and so prevent the over-use of bulls during the peak period of the insemination service. It also eases the problem of deterioration during transit of semen from one centre to another and from a centre to its sub-centres. Most of the cattle breeding centres now have facilities for holding bull semen in deep freeze storage. These facilities have also been provided at some of the sub-centres and would enable them to continue the distribution of semen if the work of the main centre should be interrupted by an outbreak of disease.

108. Deep freeze has also rendered possible the export of cattle semen. The considerations which should govern the granting of licences for the export and import of cattle semen were examined by a committee under the chairmanship of Lord Oaksey appointed by the Minister of Agriculture and Fisheries and the Secretary of State for Scotland. This committee reported in April, 1952 and pointed out that an international trade in the export of semen was bound to develop and that this country could not hold itself aloof from this trade. The committee also made a number of recommendations for regulating the export of cattle semen under licence. These recommendations were considered by the Central Advisory Committee on Artificial Insemination and the Council endorsed the arrangements drawn up by the Advisory Committee for licensing the export and import of semen.

109. Bull licensing. The Council has examined certain criticisms of bull licensing in consultation with research workers and officers of the Ministry. The main arguments advanced against the present system of licensing were that the gene content of any given breed was determined by the top herds in that breed and that bull licensing did not, therefore, get at the root of the problem of improvement; it was also argued that licensing by visual standards only was unsound. Since 1945 three types of licence have been issued:

(*a*) a beef bull licence for pedigree bulls of the beef breeds;

(*b*) a dairy (official milk record) licence for bulls of the dairy breeds whose dams and sires' dams achieve certain minimum standards of milk production;

(*c*) a general licence for bulls not qualifying for either a beef or dairy (official milk record) licence, but for which no statutory ground for refusing licences exists. (Bulls may only be refused licences for the specific reasons prescribed in the Acts.)

Future plans contemplate doing away with the general licence and raising the standards for the dairy licence.

110. After full consideration of all the views put forward, the Council expressed their firm support for the continuation of bull licensing. They felt, however, that there was room for adjustments and improvement in the light of the latest scientific knowledge and advances in the standards of cattle, and supported a proposal by the Ministry to set up a standing advisory committee on bull and boar licensing. This committee has been set up under the Chairmanship of Lord St. Aldwyn, Joint Parliamentary Secretary to the Ministry.

111. Metabolic disturbance in ruminants. The work of the N.A.A.S. Bloat Study Groups which were set up at the Council's instigation has drawn attention to the general importance of the problems of metabolic disturbances in ruminants. Such disturbances, for example grass tetany, acetonaemia and the condition bringing about a fall in milk quality when roughage is absent from the diet of dairy cows, are often associated with or mistaken for bloat. The Council's former Animal Husbandry Group considered these matters in detail and the A.R.C. has been asked to consider initiating research on the lines that appear to be most promising.

112. Pre-partum milking. The Council's attention has been drawn to the possible risks from the practice of milking cows a fortnight or so before calving in order to relieve the cow. To deprive the new-born calf of colostrum in this way may be very undesirable and the practice of pre-partum milking seems advisable only when it is desired for the cow's sake to relieve a distended udder.

113. A survey of current practice with regard to pre-partum milking was made by Provincial Livestock Husbandry Officers at the request of the Council. This survey has indicated that the practice is tending to diminish rather than to increase and that it is principally confined to limited milking of cows in need of udder relief before calving.

114. Feeding of sheep dogs. The Scottish Agricultural Improvement Council has drawn the Council's attention to a survey of sheep dog maintenance in Great Britain carried out by Dr. Russell Greig. This survey showed that 95% of working collies were fed on an unbalanced diet consisting almost entirely of cereal meals. It was suggested that the errors and deficiencies of this diet (insufficient minerals and vitamins) could be easily and cheaply rectified by the inclusion of animal protein.

115. The Council endorsed the Scottish Council's view of the importance of the proper feeding of sheep dogs and the Ministry collaborated with the Department of Agriculture for Scotland in issuing a bulletin on this subject. (The Sheep Dog: Management and Feeding, H.M.S.O., 1956)

116. **Meat research.** Though the value of our meat and milk products is roughly equal there is no single research institute for meat, whereas there are two for milk production. A good deal of meat research is going on; it is scattered among a number of bodies. The Council has expressed its strong interest in the development of meat research and the A.R.C. and the D.S.I.R. are actively considering this matter. The desirability of bringing farming and meat trade interests into consultation is recognised, and a widely based Committee is being set up to keep under review the technical problems arising at all stages in the production of livestock for food and its conversion into meat and meat products, to inform Ministers of problems requiring research and to encourage the adoption of desirable technical developments.

PIG HUSBANDRY

117. The Council has frequently drawn attention to the importance of pig recording and pig progeny testing as a means of improving the performance of pig herds.

118. **Pig recording.** With pig recording, records are maintained of the prolificacy of sows and the weights of their litters, the time taken for pigs to reach bacon weight and their gradings and carcase lengths. These records enable farmers to pin-point faults in stock and methods of management and so improve the efficiency of their pig keeping.

119. Pig recording also provides a useful service for the pedigree breeder anxious to have objective records of production to vouch for the quality of the stock he sells.

120. The Ministry set up a national scheme of pig recording in September, 1954. Satisfactory progress has been made and so far 35,000 sows have been registered in the scheme out of a total of approximately 500,000 in England and Wales.

121. **Pig progeny testing.** Progeny testing sets out to find the qualities passed on to progeny. It works by keeping under standard conditions litter groups sired by the boars under test. By taking three or four litters out of different sows, the part played by the boar can be isolated. Rates of live-weight gain, food conversion ratios and, ultimately, average carcase measurements are calculated. From published results breeders are able to identify the most efficient strains of pigs and make their purchases of breeding stock accordingly.

122. Progeny testing and pig recording are complementary to one another. The first is a move towards grading up the national pig herd, and the second a means towards making best use of the available stock.

123. Five large progeny testing stations are to be set up in Great Britain. The first will be built on the site of a small station operated by a subsidiary company of the N.P.B.A. and will be opened early next year; the remaining four will follow shortly afterwards.

124. **Antibiotics in the feeding of pigs.** Since about 1949 reports from American workers have referred to the value of supplementing the diets of pigs and poultry with small quantities of an antibiotic such as penicillin or aureomycin to bring about increases in the growth rate and the efficiency of conversion of food into flesh. American feeding stuffs contain most of their protein in the form of vegetable protein whereas in this country pigs and poultry usually receive some part in the form of animal protein. It was therefore necessary to see how animals treated with antibiotics reacted under our conditions.

125. The A.R.C. arranged trials at a number of centres including two of the Experimental Husbandry Farms. These trials and others carried out by commercial interests have shown evidence that liveweight gains and the efficiency of conversion of food into flesh are on average a little greater as the result of including antibiotics in the diet.

126. **Artificial insemination of pigs.** Research and experimental work has been in progress for some time at the Agricultural Research Council's Unit of Reproductive Physiology and Biochemistry at Cambridge on the artificial insemination of pigs. Until recently this was conducted on a laboratory scale but as a result of technical developments field trials of a commercial artificial insemination service for pig keepers are in progress at four private cattle breeding centres. These trials are at present only of a limited application as further research is necessary to find a satisfactory method of storing boar semen for longer periods, the extent to which semen can be diluted, including the use of a suitable diluent, and methods of increasing the conception rate.

127. The development so far achieved and the recommendations, in the Report of the Howitt Committee on the Development of Pig Production in the United Kingdom, stressing the need for the establishment of an artificial insemination service of pigs for the general farmer, have drawn attention to the need for controlling the practice. The Council has taken the view that artificial insemination of pigs would have only a limited application at the outset until progeny testing schemes were sufficiently advanced to indicate boars of outstanding genetic quality. Nevertheless, it was considered that when a service on a commercial scale becomes practicable this should be developed through the existing cattle breeding centres.

128. In the meantime the position is being watched both by the Council and by the Central Advisory Committee on Artificial Insemination. Regulations controlling a general service for the artificial insemination of pigs could be made at the appropriate time under Section 17 of the Agriculture (Miscellaneous Provisions) Act, 1943.

POULTRY HUSBANDRY

129. **Poultry problems.** Losses in the poultry industry due to disease are regrettably high in spite of the volume of research on the causes and means of controlling disease. It is estimated for example that losses to the industry through the common cold in poultry amount to about £10 million a year. Fowl typhoid, leucosis and fowl paralysis, salmonellosis and other disorders also add their toll.

130. The progress of research and investigation on these and breeding and rearing problems is under continual review by the Poultry Group, and the Council has been glad to learn of the developments in poultry research planned by the

A.R.C. By arrangement with the Animal Health Trust a new Poultry Research Station has been set up at Houghton Grange in Huntingdonshire, and the A.R.C. is sponsoring new work at several universities and agricultural colleges.

131. Losses due to the incorrect conditioning of birds after killing probably amount to some £3 million annually. It is believed that much of this loss could be avoided if birds intended for the table were cooled to 40°F. immediately after killing. The Council has drawn attention to the need to develop a suitable method of cooling (as opposed to freezing) table poultry. Advisory leaflets on the killing and handling of poultry after killing are being reviewed as a step towards improving the general standards of handling table birds in the poultry trade. The Council has supported the Group's recommendations for the extension of research on the common cold and other respiratory diseases of poultry.

132. Other poultry problems which the Poultry Group has under consideration concern poultry nutrition, the causes of poor hatchability and factors affecting the keeping quality of eggs.

133. Progeny testing. A full scale progeny testing scheme for poultry was announced by the Ministry in 1954 (White Paper Cmd. 9104). Its objects are to improve the quality of laying flocks and to raise the national average egg yield. In this connection the Council has drawn attention to the desirability of studying the methods used in private progeny testing schemes. The three stations needed for the scheme have now been acquired at Harrogate in Yorkshire, Wheaton Aston in Staffordshire, and Great Bookham in Surrey. It is hoped that the stations will begin operations early in 1957.

134. Research on broiler production. The question of broiler house design, about which there is little accurate information, has been examined by the Poultry Group in connection with a proposal for experimental work put forward by the Royal Veterinary College. The experiment will be carried out with three types of housing (a) the normal uninsulated housing with natural ventilation, (b) a well insulated house with controlled ventilation and (c) a climatically controlled house in which changes in temperature, humidity and concentrations of carbon dioxide and ammonia in the air can be recorded. This should provide essential basic data which will be of value in advising on housing design for this type of poultry production. The Council has endorsed the urgent need for this work and recommended that the cost of equipment should be met by an A.R.C. grant.

HORTICULTURE

135. Nuclear Stocks Scheme. The Council has been interested in the arrangements for the multiplication of fruit stocks from virus-free clones produced by the Horticultural Research Institutes.

136. Prior to 1954 the multiplication of strawberry plants was carried out at the Ministry's Experimental Husbandry Farm at Trawscoed, Aberystwyth, after which the runners were sold to selected growers who undertook to grow them on approved sites and by approved methods of cultivation and to sell the greater part of the progeny to growers prepared to enter them in the Ministry's Special Stock Certification Scheme.

137. In 1954 the Nuclear Stock Association, Ltd. was formed with official encouragement and assistance to undertake this work. The Association is an independent co-operative of plant producers which maintains close contact with the Ministry on all technical aspects of its work. The Nuclear Stock Scheme is at present confined to strawberries but it is hoped to extend it to other stocks in due course. Research Stations provide the virus-free material to the Association who arrange for it to be multiplied under contract. At the end of the first year Foundation certificates are issued for those stocks which have maintained the standards laid down by the Ministry. Runners from the stocks so certified are then distributed to growers, approved by the Association, who can conform to the stringent conditions of isolation and cultivation prescribed. Elite certificates are issued at the end of the season for those stocks which reach the prescribed standards. Runners from plants carrying Elite certificates are sold by the Association to special stock growers. At the end of this stage of multiplication the stocks are made available to commercial growers.

138. Damage to horticultural crops by spray drift. The Council's attention has been drawn to serious losses of crops caused by the drift of hormone sprays used to control weeds on neighbouring land. This problem is of particular importance to horticultural holdings on which the value of crops may be of the order of £1,000 per acre.

139. At the Council's request the Ministry sought the advice of the British Weed Control Council. While the British Weed Control Council does not consider that spray drift constitutes a widespread hazard it has suggested certain lines of research and has prepared a code of precautions to be observed in spraying. The Ministry is preparing an advisory leaflet based on this code and N.A.A.S. officers are making a special point of emphasising the damaging effects of spray drift.

140. Damage to vegetables through washing. The washing of vegetables in preparation for market gives better presentation and the prospect of a better financial return. There is a tendency for large buyers to insist on a washed product so that washing has become standard with many growers. Experience indicates, however, that washing, and especially mechanical washing (which is widely practised), may lower keeping quality. Damage may arise from the effect of water in increasing bacterial rotting of already damaged vegetables as well as from the washing operation itself. Part of the injury appears to be due to the absorption of water. This occurs mostly with root vegetables.

141. The Council's Horticulture Group has considered this problem in detail at the request of the A.R.C., on the basis of a survey of growers' practice made by Horticultural Advisory Officers and the results of preliminary tests carried out by the National Institute of Agricultural Engineering on the effects of washing vegetables. The survey and the test confirmed that some of the washing treatments led to damage and to a lowering of keeping quality, but it is clear that the problem of assessing the amount of damage and its precise origin, is not at all straightforward.

142. Fundamental physiological studies seem to be the necessary precursor of a proper understanding of the nature of the effects produced by washing vegetables either by hand or by machine.

143. Bird pests of fruit. At the suggestion of the Council's Horticulture Group some investigations were carried out to test the effectiveness of various traditional methods of preventing damage to the young buds of fruit trees by small birds, notably bullfinches. The investigations gave disappointing results but were of value in showing the need for more effective means of protection. The Council has supported the view that the serious problem of damage by birds ought to be studied on more systematic and fundamental lines than those followed hitherto.

144. The Ministry's ornithologists are now following a research programme by which it is hoped to obtain the basic facts on which practical measures of control may be based. It is intended to confine the work at present to rooks, wood-pigeons and bullfinches. Each of these subjects presents a somewhat different set of combinations of ornithological and ecological factors which will require observation and experiment over a long period.

145. Research on cider, perry and fruit juices. The difficulty of disposing of fruit profitably in seasons of glut is one of long standing. Pioneer work on this problem dates from 1903, when the Fruit and Cider Institute, now known as the Long Ashton Research Station, was set up. Since that time the Station has been responsible for several important advances in the utilisation of fruit and fruit products. Among these achievements mention may be made of work leading to the well known Campden method of fruit preserving, the extraction of pectin (used in jam setting) from apple pomace, and the research work which made supplies of vitamin C in the form of blackcurrant and rose hip syrups available to the Ministry of Food during the last war.

146. The Council, through its Horticulture Group, reviewed the development of this side of the work at Long Ashton together with proposals for its expansion, particularly in relation to the present needs of the fruit industry. These needs include outlets for apple juice in the form of a soft drink of improved palatability a method of cheapening the cost of apple juice drinks and of improving their flavour, and the utilisation of natural fruit juices in soft drinks on a scale comparable with the use which is made at present of the citrus fruits. Research on these aspects of fruit growing has hitherto been on a restricted basis. It is likely that more attention will now be devoted to them as the result of recommendations made to the A.R.C. by the Council.

147. Light irradiation of tomatoes. There is little accurate information at present on the optimum temperatures for growing tomatoes. Different varieties of tomatoes require different temperatures and possibly different combinations of irradiation with temperature. Some varieties respond to supplementary irradiation supplied in the form of artificial lighting. Proposals for experimental work using three levels of irradiation treatment with three minimum night temperatures were put forward by the Electrical Research Association with a view to their being carried out at an Experimental Horticulture Station.

148. The Council considered, however, that such experiments were of too fundamental a nature to be suited to the stations and that further research was needed on temperature relationships before tests on a commercial scale were possible. Some harm to tomato crops has already occurred through the application of artificial lighting by growers before the technique of using it correctly has been worked out.

LAND MANAGEMENT

149. Problems under this heading fall within the sphere of the Land Management Committee and cover a wide field. They include such matters as farm buildings, farm roads, shelter belts, field drainage, water supply and irrigation, and electricity supply. The following paragraphs give an indication of some of the problems under examination.

150. **Buildings.** A great deal of work has been carried out on the design, construction, layout and adaptation of various buildings in farm and horticultural use. Horticultural packing sheds, for example, which are being increasingly used for all kinds of horticultural produce, do not seem to be designed so as to achieve the maximum economy in time and effort. A survey carried out by the Ministry's officers has shown the need for further fundamental information on such aspects as floor space, height, temperature, humidity, thermal insulation and ventilation. An examination is also being made of the factors to be taken into account when deciding whether to adapt an existing farm building or whether to build a new one; and consideration is being given to a study to discover the extent to which expenditure on new farm buildings or the major conversion of older premises has been economic in relation to the profitability and efficiency of production. The problem of condensation in cowhouses and the relative efficiency of different designs in pighouses are also receiving attention.

151. **Work simplification.** Some progress has already been made towards introducing work study techniques into agriculture. The adaptation and improvement of farm buildings offers a good opportunity for applying the principles of work simplification and a study of the layout of dairy buildings has already been completed. Work in this field is being extended and the Ministry hopes to produce a bulletin in the near future.

152. **Drainage and water supply.** The obstacles, both technical and economic, in the way of efficient field drainage are under examination. The Council is considering the increasing irrigation of crops, having regard to the growing problems of water supply and the husbandry and economic factors.

153. **The effects of shelter.** The establishment of shelter belts is a prolonged and costly business. It is hoped to carry out a study, designed to show the effect of shelter on grazing animals and plant growth, in co-operation with the meteorological service, who are obtaining information about the climatic effect of shelter on relatively small areas.

154. **Horticultural development.** A survey is being made to discover areas suitable for horticultural development bearing in mind soil conditions, water availability, climate and exposure.

155. **Roads.** Work on farm road construction is continuing. The soft fen road presents special difficulties, and is receiving particular attention. Experiments are being undertaken with the object of designing more effective cattle grids.

156. **Bibliography of land management subjects.** At present no complete reference list of studies in land management is available. A bibliography is now in course of preparation.

MISCELLANEOUS PROBLEMS

157. **Herbicides and the balance of nature.** The attention of the Council has been drawn to the possible harmful effects on the balance of nature resulting from the

increased use of chemicals. The question was raised more particularly in connection with attempts to reduce the high labour costs of cutting weeds in roadside verges by substituting spraying operations with herbicidal sprays. The matter has been referred to the A.R.C. and been considered by entomologists, the Nature Conservancy and research workers. Preliminary surveys of the effect of spraying roadside verges on their flora and fauna indicate that the question is a complex one. For example, in destroying weeds which act as hosts to injurious insects, other weeds which are hosts for insects predatory on injurious insects may also be destroyed. However, it would appear that widespread spraying of roadside verges in the near future is unlikely. In the meantime County Councils have been advised by the Ministry of Transport and Civil Aviation to proceed with spraying programmes in a cautious and experimental manner.

158. The Working Party on Precautionary Measures against Toxic Chemicals used in Agriculture, under the chairmanship of Sir Solly Zuckerman, includes Council members. The main recommendations of its third report (Toxic chemicals in Agriculture—Risks to Wild Life—H.M.S.O. 1955) were that the terms of reference of the Interdepartmental Advisory Committee set up in accordance with the recommendations of the Working Party's second report should be widened to include risks to wild life arising from the use of toxic chemicals on pests and weeds; that the need for further research and investigation should be brought to the notice of appropriate bodies; and that the importance of adopting the precautionary measures indicated in the report be clearly made known to spraying contractors, farmers, growers and beekeepers.

159. Machines for spraying insecticides and herbicides. The Council has supported the provision of a Ministry grant to the Long Ashton Research Station for work on the design and development of improved machines for applying insecticides and herbicide sprays.

160. Members of the Council attended a demonstration in May, 1953, at Long Ashton of the latest machine whose novelty lies mainly in the use of high air velocities. The employment of this principle promises to bring about a considerable reduction in the requirements for spray material and labour. The machine is being used as a prototype for commercial development.

161. Lime and fertilizer application from aircraft. Hill grazings often get little or no liming and manuring because of their extent, remoteness from the farm and their inaccessibility to ordinary transport. The nutrient status of the soil being low it might be anticipated that it would respond to even light dressings of lime and fertilizer. That this is so has been indicated in New Zealand, where experiment and practice have shown that the top dressing of hill pastures with the use of aircraft is a feasible proposition under certain conditions.

162. Following a private demonstration of this method at Plynlimmon in 1950, the Council gave further consideration to its possibilities. It is clear that the main factor governing success is the return which can be expected from the comparatively light dressings to which this expensive method of applying nutrients has to be confined to be economic. In New Zealand phosphate dressings alone give benefit but in this country lime may also be needed.

163. As the value of light dressings can be tested by normal field plot experiments arrangements have been made through the Hill Farming Research Organisation for a series of manurial trials on hill farms in Great Britain to be carried out in collaboration with N.A.A.S. Provincial Centres. Further trials with aircraft will await the results of these experiments.

164. **Alternatives to superphosphate.** Whilst the solution of many of the problems considered by the Council is of a long-term nature, there are also *ad hoc* problems on which the Council's advice is sought, in some instances as a matter of urgency. A good example of these short-term problems arose in 1951 when American exports of sulphur to this country were suddenly reduced.

165. Since much of this imported sulphur is used to make sulphuric acid which is essential to the manufacture of superphosphate it became necessary to seek alternatives to superphosphate and, in the meantime, eke out what superphosphate could be made. On the Council's recommendation this was achieved by reserving superphosphate for crops that needed it most, and at the same time reducing the amount normally used in making up National Compound Fertilizers. The Council also encouraged the laying down of 44 field experiments to compare the value of other, including new forms, of phosphate with superphosphate. The results of these experiments have provided much needed information quite apart from any urgent future necessity to economise in superphosphate.

166. **Machinery for the maintenance of ditches.** The Council's attention has been drawn to the urgent need to reduce hand labour in the maintenance of ditches by the greater use of machines and consideration has been given to the steps which are being taken to provide a machine suitable for the purpose, on which work is proceeding at the National Institute of Agricultural Engineering. The Ministry's Land Drainage Division is co-operating closely with work on the development of ditch clearing machines and tests of their performance under practical conditions. Machines developed abroad are also being studied with a view to testing their suitability for this country.

167. **Atmospheric pollution and crop growth.** Atmospheric pollution reduces crop growth mainly by interfering with the plant's respiratory process. Soot and grease from smoke laden air block the stomata through which the plant breathes so that photosynthesis (the building up of carbohydrate material under the influence of light) is reduced. That part of the smoke which remains suspended in the air reduces the amount of light which reaches the leaves, so that photosynthesis is still further reduced. Gases in industrial smoke, for example sulphur dioxide, may also injure crops by depriving the leaves of part of their ability to absorb carbon dioxide from the air in order to build up new plant material.

168. The Great House Experimental Husbandry Farm is studying the problem by carrying out daily recordings of soot deposition etc. by means of an air filtration instrument. It is also observing the productivity of different species of grass under conditions of smoke pollution.

169. The Council has included problems of smoke pollution among those which it considers should be given a high priority for investigation. It did not consider that the work in progress on this subject was adequate at present, and recommended to the A.R.C. that smoke pollution studies at Manchester University should be continued and extended.

170. Information on the effects of air pollution on agriculture was given by the Ministry of Agriculture, Fisheries and Food to the Committee on Air Pollution

appointed in July 1953 by the Minister of Housing and Local Government. General legislation to reduce damage from air pollution has been introduced by the Government following consideration of the Committee's report.

171. **Agricultural meteorology.** Agricultural production is closely related to weather conditions and considerable advances have been made in agricultural meteorology in recent years. A start was made in 1922 by setting up a series of crop weather stations in different parts of the country with a view to correlating crop performance with weather. There are now about 60 such stations in England and Wales.

172. The Council is fully aware of the important contribution which meteorological studies bring to the solution of many crop and livestock problems and has enlisted the meteorologist's help in a number of directions.

173. In 1947, a big step forward was taken in the formation by the Meteorological Office of a separate Agricultural Meteorology Branch to deal with meteorological aspects of the farmer's and grower's difficulties. In addition there have been initiated at the Provincial Centre of the N.A.A.S. at Bristol and at Cambridge, sections, in charge of Senior Scientific Officers of the Meteorological Office staff which advise on weather problems and have sponsored or assisted in a series of experiments in which meteorological factors are closely concerned. This work, now being carried out at many centres, includes studies of climate under glass, the irrigation requirements of crops, frost liability, the protection of crops from the effects of frost, forecasting potato blight attack, apple scab, the effect of shelter belts on crops and livestock, soil temperature studies, and the storage of root crops.

174. Sufficient progress has been made on several aspects of agricultural meteorology, e.g. on irrigation needs and the risk of frost damage, for useful advice to be given.

175. The problem of shelter for crops and stock is the subject of continual requests for advice. Information is particularly needed on the provision of shelter belts for stock on hill and exposed land and on the use of various types of windbreaks for crop protection. Experimental work on this subject on hill farms has been put in hand at the instigation of the Council. Similarly, work on shelter for horticultural crops is proceeding at the Experimental Horticulture Stations.

176. Regular reports are sent by C.A.E.C.'s to the Meteorological Office concerning the current work on the land and the significant weather. These reports are used in the preparation of weather forecasts.

177. A very interesting resumê of the practical aspects of agricultural meteorology together with details of the forecast services available to farmers were given in the Ministry's Bulletin No. 165 "Weather and the Land" first published in 1955.

178. The work of the Meteorological Office is being reviewed by a Committee appointed by the Secretary of State for Air under the Chairmanship of Lord Brabazon. The agricultural aspects of meteorology have been put before the Committee at their request.

179. **Survey of sand lands.** The third of a series of surveys of systems of farming, which are being conducted under a Committee set up by the Council refers to farms in sand land areas under low rainfall. The report on this survey was issued

by the Ministry as Bulletin No. 163—"Agriculture of the Sand Lands."

180. Sandy soils present difficulty largely because of their low retentive power for moisture. They tend to be acid and to have a low reserve of plant nutrients and of organic matter so that they are not easily maintained in a high state of fertility. These factors, especially that of low moisture retention, present still greater difficulty under a rainfall of less than 30in. per annum. Some improvement can be effected by the use of drought resistant crops, lucerne and lucerne-grass mixtures, for example; by adopting systems of cropping and animal husbandry that rely least on June and July rainfall; and by adapting the methods of sand land husbandry to new conditions of marketing and competition.

181. The Council has received a report on the advisory work, the field experiments, demonstrations and farm management studies being carried out on sand lands and is satisfied with the progress being made.

182. Gas liquor as a fertilizer. Where gas liquor is not converted to sulphate of ammonia it is often applied to land direct as a source of nitrogen, the disadvantages being the high cost of transport and the tendency of impurities to cause "burn." The Council has followed the progress of trials conducted by N.A.A.S. Soil Chemists to test the value of gas liquor against sulphate of ammonia as a fertilizer. In general the results show that sulphate of ammonia tends to give higher yields of grass and higher amounts of protein.

183. Restoration of sea inundated land. When the coastal defences of the eastern counties of England were breached on 1st February, 1953, approximately 160,000 acres of agricultural land were flooded by the sea. Sea water flooding leaves a high concentration of salt in the soil. This is not only inimical to the growth of farm and horticultural crops but in the absence of ameliorative measures produces marked changes in soil structure, especially in heavy soils; the permeability of the soil to water is much reduced (i.e. it drains badly) and in dry weather the soil dries out into a condition in which it cannot be worked down to a satisfactory tilth. Working the soil soon after flooding is found to slow down the natural process of restoration, which begins with the removal of salt by the action of rain percolating downwards through the soil.

184. Immediate action was taken by the N.A.A.S. to advise farmers of the best means of restoring the land, with particular emphasis on the need to refrain from working the soil soon after flooding and on the value of applications of gypsum to help to maintain soil structure and resulting free drainage.

185. Many valuable lessons have been learnt on the methods of restoring sea flooded soils and the technical and advisory problems involved. A committee is at present working on a report which will put the information on record for use should a flood emergency arise in the future. This report will also contain an interim report on a number of long-term critical field experiments which have been carried out on specially rented flood damaged sites.

186. Productivity. The Council's advice has been sought on the extent to which the British Productivity Council might help in promoting increased productivity and efficiency in agriculture. The Council considered that, on the whole, the machinery already available for this purpose was adequate but that within the limits set by the many differences between agriculture and industry it would be useful if there could be an exchange of views and ideas at local level. C.A.E.C's have accordingly established contact with suitable neighbouring Local Productivity Councils with a view to stimulating the interest of farmers and farm workers in methods of increasing efficiency such as work simplification. Progress in this collaboration is being kept under review.

187. Special surveys of agriculture. The Council has considered the place of survey techniques in agriculture. A beginning was made during the war with a survey of fertilizer practice which originally aimed to measure the application of fertilizers to different crops on the different types of farms in Britain. Now information is being obtained on changes in practice. The data are proving of great value to the Ministry in reaching decisions on policy relating to fertilizers, and can indicate the lines which research and advisory work should follow. Officers of the N.A.A.S., many of whom take an active part in providing field data for the survey, now have a much clearer picture of fertilizer usage; they know under what conditions it would repay the farmer to make greater use of fertilizers and where, on the other hand, the customary levels of application are unlikely to give economic returns.

188. Several other aspects of farming, including hill farming conditions and diseases of dairy cattle, have been the subject of similar surveys and the Council endorsed the value of the technique in dealing with certain problems.

We have the honour to be,

Sir,

Your obedient Servants,

(*Signed*) E. A. Hitchman (*Chairman*)
E. J. Salisbury (*Vice-Chairman*)
J. F. Bomford
Harold Collison
F. L. Engledow
Hugh Finn
Frank Ll. Griffith
T. Neame
Northumberland
H. J. Rathbone
F. Rayns
E. J. Roberts
W. K. Slater
H. Cole Tinsley
James Turner
T. Wallace
Jas. A. S. Watson
E. G. White

W. Morley Davies (*Secretary*)

11th June 1956

APPENDIX A

COMMITTEES OF THE COUNCIL AND THE JOINT COMMITTEE

1. Experimental Husbandry Committee

(a) Composition

Mr. F. Rayns (*Chairman*)

3 *A.I.C. Representatives*
Mr. F. Griffith
Sir James Turner
Professor Sir James Scott Watson

3 *A.R.C. Representatives*
Sir William Ogg
Sir Edward Salisbury
Sir William Slater

3 *N.A.A.S. Representatives*
Mr. H. Trefor Jones
Mr. W. Longrigg
Mr. R. Rae

Mr. P. J. Macfarlan (*Convenor*)

(b) Terms of Reference

"To receive and consider proposals for investigational work by the National Agricultural Advisory Service on Experimental Husbandry Farms and elsewhere; to make recommendations to the Ministry as to the work to be undertaken, and as to the allocation of the facilities available at the several Experimental Husbandry Farms; and to report accordingly to the A.I.C., to advise the Ministry on the suitability of properties for use as Experimental Husbandry Farms; and to receive periodic reports on the conduct of the investigational work within its purview."

2. Experimental Horticulture Committee

(a) Composition

Professor T. Wallace (*Chairman*)

2 *A.I.C. Representatives*
Capt. J. F. Bomford
Mr. T. Neame

2 *A.R.C. Representatives*
Mr. G. Graham Samuel
Professor R. H. Stoughton

2 *N.A.A.S. Representatives*
Mr. O. G. Dorey
Mr. R. Rae

Mr. P. J. Macfarlan (*Convenor*)

(*b*) *Terms of Reference*

"To receive and consider proposals for investigational work by the National Agricultural Advisory Service on Experimental Horticulture Stations and elsewhere; to make recommendations to the Ministry as to the work to be undertaken, and as to the allocation of the facilities available at the several Experimental Horticulture Stations and to report accordingly to the A.I.C.; to advise the Ministry on the suitability of properties for use as Experimental Horticulture Stations; and to receive and consider periodic reports on the conduct of the investigational work within its purview."

3. Land Management Committee

(*a*) *Composition*

His Grace the Duke of Northumberland (*Chairman*)
Mr. W. G. Alexander
Mr. J. T. Beresford
Mr. D. Christy
Mr. Harold Collison
Major E. S. Dobb
Mr. J. A. McMillan
Mr. H. J. Rathbone
Professor Ellis J. Roberts
Mr. R. G. A. Lofthouse (*Convenor*)

(*b*) *Terms of Reference*

"To keep under review the progress of research in land management subjects with a view to seeing that results are made known among those responsible for the management of land and to encourage the use of improved technical methods and the adoption of new and improved designs, and to advise the Minister of Agriculture from time to time on land management subjects which appear to require scientific investigation and, generally, as to the lines on which policy designed to raise the technical and economic standards of land management can best be implemented."

4. Fenland and Peat Committee

(*a*) *Composition*

Dr. E. C. Childs
Mr. W. Morley Davies
Mr. F. Hanley
Mr. J. A. McMillan
Mr. W. B. Mercer
Mr. H. H. Nicholson
Sir William Ogg
Mr. J. B. E. Patterson
Mr. F. Rayns
Mr. H. Cole Tinsley

(*b*) *Terms of Reference*

"To report and make recommendations to the A.I.C. on technical improvements in the present uses of fen and peat soils in England and Wales and on the conservation and reclamation of such soils."

5. Types of Farming Surveys Committee

(*a*) *Composition*

Professor Sir Frank Engledow
Mr. F. Hanley
Mr. F. Rayns

(*b*) *Function*

The Committee is responsible for arranging for the carrying out of surveys representing regional and national aspects of farming systems.

6. Poultry Group

(*a*) *Composition*

Mr. H. R. Finn (*Chairman*)
Dr. R. F. Gordon
Mr. G. Guttridge
Mr. G. O. Hoskins
Dr. S. C. Kon
Mr. J. Sutton
Dr. H. Temperton
Mr. Cyril Thornber
Mr. W. J. Welford
Dr. R. Coles (*Convenor*)

(*b*) *Function*

The function of the Group is to assess the relative importance of the problems of the industry and to recommend priorities for research work.

7. Horticulture Group

(*a*) *Composition*

Mr. T. Neame (*Chairman*)
Capt. J. F. Bomford
Mr. A. H. Hiller
Mr. P. J. Moss
Mr. C. E. Hudson (*Convenor*)

(*b*) *Function*

The function of the Group is to assess the relative importance of the problems of the industry and to recommend priorities for research work.

8. Taint Committee

(*a*) *Composition*

Mr. C. E. Hudson (*Chairman*)
Mr. W. B. Adams
Dr. R. de Brath Ashworth
Dr. M. Cohen
Mr. W. Morley Davies
Mr. A. D. Harrison

Mr. W. C. Moore
Mr. C. E. Pearson
Dr. C. Potter
Mr. G. Graham Samuel
Mr. F. A. Secrett
Mr. A. C. Sellers
Mr. W. A. Williams
Dr. D. W. Wright

(*b*) *Function*

The Committee was set up to consider the question of taints and other harmful effects arising out of the use of plant protection chemicals.

Joint Committee of the Agricultural Improvement Councils and the Agricultural Research Council

(*a*) *Composition*

Sir Edward Salisbury (*Chairman*)

A.I.C. for England and Wales
Mr. F. Rayns
Mr. H. Cole Tinsley

A.I.C. for Scotland
Dr. Joseph Duncan
Professor A. B. Stewart

A.R.C.
Professor L. P. Pugh
Sir Solly Zuckerman

(*b*) *Terms of Reference*

1. To review from time to time the technical problems of agriculture and horticulture.
2. To recommend priorities and the importance which should be attached to particular problems.
3. To review existing research in each particular field in relation to the needs of the industry and advise the Councils as to its adequacy.
4. To consider any other matters which may be referred to it from time to time by the three Councils.

5. Types of Farming Surveys Committee

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Professor Sir Frank Engledow
Mr. F. Hanley
Mr. F. Rayns

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APPENDIX B

CHANGES IN MEMBERSHIP

1. During the six-year period under review two Councils have been in office, one appointed in June, 1950 and the other in June, 1953.

2. In June 1950 all the existing members accepted an invitation to serve for a further period and Mr. H. R. Finn and Mr. H. Cole Tinsley were appointed to fill vacancies left by previous resignations.

3. Professor F. Blakemore was appointed to the Council in July 1952 when Sir Thomas Dalling took up an appointment overseas. In October of the same year Sir Donald Vandepeer retired from the public service and his successor, Sir Alan
is place as the Council's Chairman.

increased so that the new Council might be
roblems of estate management and the Duke
Rathbone were appointed. Other new mem-
Ll. Griffith, Professor E. J. Roberts and Pro-
bers were Mr. D. G. Brown, Mr. A. Holness,
nd Dr. H. V. Taylor.

G. Sanders relinquished his membership on
dviser (Agriculture) to the Minister but has
s official capacity. He was succeeded on the
tt Watson, who had recently retired from the
ltural Adviser.

ril, 1955, for health reasons and in August,
ely death, the services of Professor F. Blake-
t. J. F. Bomford and Professor E. G. White.

APPENDIX C

(i) EXPERIMENTAL HUSBANDRY FARMS

County	*Address*	*Soil Type*	*Acreage*	*Average Annual Rainfall in.*	*Altitude ft.*
Hants.	Bridget's Farm, Martyr Worthy, Winchester.	Chalk	1,035	34	300
Cambs.	Cuckoo Pastures, Boxworth.	Boulder Clay	849	22	190
Warwicks	Drayton Manor Farm, Stratford-on-Avon.	Heavy Clay	450	24	200
Notts.	Gleadthorpe Farm, Welbeck Colliery Village, Mansfield.	Bunter Sand	493	24	150
Lancs.	Great House Farm, Helmshore, Rossendale.	Boulder Clay	350	50	700–1,200
Yorks.	High Mowthorpe, Duggleby, Malton.	Chalk	1,070	38	400–650
Lincs.	Kirton Farm, Kirton, Boston.	Silt	104	22	14
Cardigan	Pwllpeiran Farm, Cwmystwyth Aberystwyth.	Peat and Shale	3,000 (Approx.)	55	750–2,100
Hereford	Rosemaund Farm, Preston Wynne.	Old Red Sandstone	436	26	250
Norfolk	Terrington Farm, Terrington St. Clement, King's Lynn.	Silt	200	22	13
Cardigan	Trawscoed, Aberystwyth.	Medium Loam	1,000	50	100–1,100
Somerset	Liscombe Farm, Dulverton.	Devonian Shales and Sandstones	485	55	800–1,200

(ii) EXPERIMENTAL HORTICULTURE STATIONS AND SUB-STATIONS

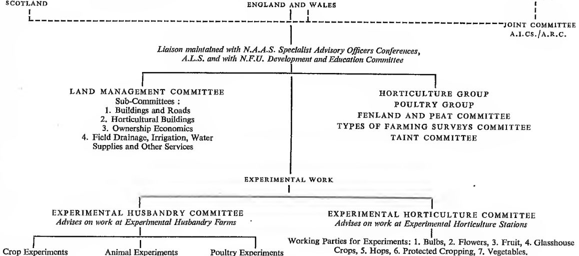
County	*Address*	*Main Lines of Work*	*Acreage*	*Average Annual Rainfall in.*	*Altitude ft.*
Hants.	Efford Experimental Station, Lymington.	Flowers, Fruit, Glasshouse, Vegetables.	376	28	20–60
Lancs.	Fairfield Experimental Horticulture Station, Kirkham, Preston.	Glasshouse Construction and Crops	22	35	80
Lincs.	Kirton Experimental Husbandry Farm, Kirton, Boston.	Bulbs and Vegetables	104	22	14
Warwick	Luddington Experimental Horticulture Station, Stratford-on-Avon.	Flowers, Fruit, Vegetables and frame crops	230	24	110–190
Cornwall	Rosewarne Experimental Horticulture Station, Camborne.	Bulb crops, flowers and early vegetables	109	43	140–160
Cornwall	Ellbridge Sub-Station, Hatt, Saltash.	Needs of the Tamar Valley	5	45	100
Yorks.	Stockbridge House, Experimental Horticulture Station, Cawood, Selby.	Fruit, vegetables crops in frames and structures	161	24	25
Kent	National Fruit Trials (Brogdale) Brogdale Farm, Faversham.	Fruit varieties	185	24–25	140–200
Surrey	Wisley National Fruit Trials, R.H.S. Gardens, Wisley, Ripley	Fruit varieties	42	24–25	60
Herts.	Lea Valley Sub-Station, Hoddesdon.	Glasshouse construction and crops	26	24	135

(iii) HORTICULTURE DEMONSTRATION STATIONS (WALES)

County	*Address*	*Main Lines of Work*	*Acreage*	*Average Annual Rainfall in.*	*Altitude ft.*
Caerns.	Bryn Adda Demonstration Station, Bangor	Local Crops	26	42	225–300
Mon.	Cleppa Park Demonstration Station, Newport.	Local Crops	68	40	52–106
Cardigan	Trawscoed Demonstration Station, Aberystwyth	Local Crops	3	50	100

APPENDIX D

AGRICULTURAL IMPROVEMENT COUNCIL FOR ENGLAND AND WALES


A.I.C.
SCOTLAND
liaison maintained
A.I.C.
ENGLAND AND WALES
A.R.C.
JOINT COMMITTEE
A.I.CS./A.R.C.
Liaison maintained with N.A.A.S. Specialist Advisory Officers Conferences, A.L.S. and with N.F.U. Development and Education Committee
LAND MANAGEMENT COMMITTEE
Sub-Committees :
1. Buildings and Roads
2. Horticultural Buildings
3. Ownership Economics
4. Field Drainage, Irrigation, Water Supplies and Other Services
HORTICULTURE GROUP
POULTRY GROUP
FENLAND AND PEAT COMMITTEE
TYPES OF FARMING SURVEYS COMMITTEE
TAINT COMMITTEE
EXPERIMENTAL WORK
EXPERIMENTAL HUSBANDRY COMMITTEE
Advises on work at Experimental Husbandry Farms
EXPERIMENTAL HORTICULTURE COMMITTEE
Advises on work at Experimental Horticulture Stations
Crop Experiments Sub-Committee
Animal Experiments Sub-Committee
Poultry Experiments Sub-Committee
Working Parties for Experiments: 1. Bulbs, 2. Flowers, 3. Fruit, 4. Glasshouse Crops, 5. Hops, 6. Protected Cropping, 7. Vegetables.
Plant Pathology Committee

Printed in Great Britain under the authority of Her Majesty's Stationery Office by
The Stockport Express General Printing Works, Heaton Lane, Stockport. Wt. 2989K